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Abstract of the Disclosure

A linear chemical mechanical polishing apparatus that is equipped with a programmable pneumatic support platen and a method for controlling the polishing profile on a wafer surface during a linear CMP process are disclosed. The programmable pneumatic support platen is positioned juxtaposed to a bottom surface of a continuous belt for the linear CMP apparatus and positioned corresponding to a position of the wafer carrier so as to force the polishing pad against the wafer surface to be polished. The support platen has a predetermined thickness, a plurality of apertures through the thickness and a plurality of openings in a top surface in fluid communication with a gas source through the plurality of apertures. The method for controlling the polishing profile can be carried out by flowing a gas flow through the plurality of apertures and the plurality of openings to force an intimate contact between the wafer surface to be polished and the polishing pad. The plurality of openings may be suitably arranged in various control zones on the surface of the support platen with each zone equipped with a pressure detector and a flow regulator such that the gas flow pattern can be programmed to any desirable pattern for achieving polishing uniformity on a wafer surface.